burning patches of jungle, and moving on to new spots after a few years. Much of the land is very fertile, and well suited for both early and late rice crops. Channels, often of great length, are dug by the Mechs from the numerous streams for the irrigation of the late rice crops, though the tendency of the rivers to deepen their beds in the friable soil is a difficulty to more permanent settlers. The climate and the exposure to raids from Bhután have keep the country in a backward state. It became British territory as a result of the war of 1864. Much land has since then been settled and tea-gardens opened, especially in the western part; while within the last three years a large tract of jungle has been provisionally set apart by Government—at the instance of the Rev. A. J. Shields, C.M.S. missionary to the Santals, warmly supported by Mr. D. Sunder, settlement officer at Jalpiguri—for settlement by Santals, who in their hill country south of the Ganges are often unable to obtain sufficient land for cultivation. Forty families were taken up in 1891, the author assisting in their settlement, and still larger numbers have followed since. Although the partial failure of the rains in the first season caused unforeseen difficulties at first, these, it is hoped, are now in a fair way to be overcome. It should be mentioned that a similar experiment has been tried with success in Assam by a Norwegian mission."

Captain Williams, R.A., gave a popular address on the people of Uganda; Mr. Herbert Ward sent a short paper on the people of the Congo Basin; and Dr. R. W. Felkin submitted a new scheme for a map of the distribution of diseases in Africa. The Rev. C. H. Robinson gave an interesting account of the adventures of a Hausa pilgrim who passed through Khartum on the way to Mecca immediately after the capture of the town by the Mahdi, and gave a new version of the story of General Gordon's death. Mr. E. G. Ravenstein read a brief report of the Committee on African Climatology, which is engaged in accumulating meteorological data from the tropical parts of the colony.

Many of the communications were illustrated by the lantern, and the last paper read was on a system of geographical teaching in which the lantern is adapted for general use in schools, by Mr. B. Bentham Dickenson, of Rugby. A small association has been formed in order to promote this object.

The meetings of the Section were never attended by a larger average number than this year, and on the whole the scientific value of the papers has seldom been greater.

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## *MECHANICS AT THE BRITISH ASSOCIATION.*

IN Section G, that devoted to mechanical science, at the recent Nottingham British Association meeting, there were fewer papers read than usual. This, however, was a distinct advantage, for this section has generally suffered from an overabundance of matter. It is far more satisfactory to have a few good papers well discussed than a multitude of mediocre or inferior contributions, which only weary the audience, and lead to no good result. The section held its meetings in the Engineering Lecture Theatre, at University College, and the first sitting took place on Thursday, September 14, according to precedent. The president this year was Mr. Jeremiah Head, whose address we reprinted on September 21. The first paper taken was a contribution by Mr. Beaumont, entitled the "Automatic Balance of Reciprocating Mechanism," and referred to a method of utilising the vibration caused by a revolving weight for working sieves. In the discussion which followed, the opinion was expressed that the device might find a useful place in other applications than that for which it was originally intended. The rest of Monday's sitting was taken up by a description of lace machinery and hosiery machinery. Although the subject is one of considerable interest, it would be impossible to give any adequate idea of the proceedings without the numerous diagrams and lantern slides which were used by the author of the paper. Several of the most interesting machines described were shown at work in an adjoining room, and their action was explained by Mr. W. Robinson, the Professor of Engineering at University College, Nottingham.

On Friday, the 15th inst., two reports were down for reading; the first that of the committee on the dryness of steam in boiler trials, in regard to which Prof. Unwin stated that practically nothing had been done during the past year, and therefore there was no report to present. It was hoped, however, that by following certain lines of investigation which had been suggested by some American experimentalists, that good results might be arrived at, and it was hoped that a satisfactory report would be prepared for the next meeting. The report of the committee on Graphic Methods was a contrast to Prof. Unwin's statement; it being of an exceedingly voluminous character. This is the second long report that has been presented by the committee. It would be quite impossible to deal with the subject in an account of the proceedings such as we are able to give, which must necessarily be brief, and as the report will be printed in full, in common with all reports of committees, in the Proceedings, we will refer our readers to the volume when it is issued, for information on this really important subject. It is fair, however, to notice the immense amount of good and sound work that Prof. H. S. Hele Shaw has done, as secretary, in preparing the reports of this committee.

Two papers on the disposal of refuse followed; one by Mr. C. C. Keep, and the second by Mr. William Warner. In these various descriptions of destructors which had been placed upon the engineering market were described. Both authors are, we believe, members of firms which manufacture and sell apparatus of this description, and trade interests were not altogether lost to sight. The subject of refuse destruction is one of great importance, but it requires, in the interests of sanitary science, to be handled in a somewhat different manner to that pursued by the section in the reading and discussion of the papers. Mr. Frank Ashwell next read a paper on "Warming and Ventilating," in the course of which he discussed the merits of the plenum system, as against the method of ventilation by partial vacuum. He had not much difficulty in establishing the claims of the former; the chief advantage, of course, being that with a plenum inside the building any leakage there may be at doors, windows, &c. does not admit draught; the air for ventilation always coming in through the proper entrance, where it may be warmed, filtered, and, if necessary, moistened. Watchmaking by machinery next occupied the attention of the section, Mr. T. P. Hewitt, of Prescot, reading an interesting paper on the subject. As was stated by a speaker during the discussion which followed, watchmaking in England has been lately at a very low ebb. For many years it has had to meet the competition of cheap labour in Switzerland, but the most fatal blow to the system was struck by the introduction of the factory system for the manufacture of watches in America. By the use of machine tools and labour-saving appliances the Americans have been able to produce excellent timekeeping watches at a very moderate cost; for the industry is one specially suited to the genius of the American mechanic, whose inventive faculties are proverbial. So serious a blow has thus been inflicted on the English watchmaking industry that its operatives were brought to the greatest distress. Prescot, in Lancashire, is a very ancient centre of watchmaking, that is, so far as the movement of the watch is concerned, and many of the best English watches have Prescot works. It is in this town that an endeavour is being made to revive the English watchmaking industry, but on entirely new lines. A large factory has been built, and the most improved appliances introduced. These, of course, are largely American in origin, but it is satisfactory to know that the beautiful machine tools, such as used by the Waltham and Elgin Watch Companies, can now be made in England, and are equal to the productions of the United States. Several examples of these machines were exhibited during the reading of the paper.

Mr. Ross, of Glasgow, next described a pneumatic caulking and chipping tool. This is a hand-tool, working, as its name would imply, by compressed air, or steam may be used. It will make over 10,000 strokes per minute, and consists essentially of a small cylinder and loose piston, which works on to the caulking or chipping chisel. The only thing the operator has to do, therefore, is to guide the tool, and the enormous rapidity of the strokes enables the finest work to be done, either in caulking a metal seam or in chipping down a metallic surface. Some very beautiful specimens of work were shown at the meeting, and the instrument itself was exhibited.

It is the custom of Section G to devote Monday of the Association meeting to electrical science, and the first paper taken on the 16th was a contribution by Mr. Gisbert Kapp, entitled "Relative Cost of Conductors with Different Systems of Electrical Power Transmission." This was a most useful paper, and a good example of the form contributions on electrical subjects should take in Section G, where, it must be remembered

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electrical engineering, and not physics, should be treated upon. The author said that until recently, electrical machines for the transmission of power were of the continuous current type, but lately alternate current apparatus had come into use, chiefly because the power could be carried to greater distances with a moderate cost of conductors. The reason for this was that with continuous current plant the voltage is limited by the difficulty of insulating the generating machinery. With alternate current there is no necessity of high insulation of generator or motor, but only of the transformers, which can be easily insulated by the use of oil or other means. The author dealt with five systems of transmission.

(1) Single phase alternating current transmission by two wires.
(2) Double ,, ,, ,, ,, ,, four ,,
(3) ,, ,, ,, ,, ,, ,, three ,,
(4) Three ,, ,, ,, ,, ,, three ,,
(5) Continuous current with transmission by two wires.

We have not space to follow Mr. Kapp's ingenious reasoning, but will briefly give his conclusions. If all systems were put on the same footing as regards efficiency and safety of insulation, the following results would be obtained. If, for the transmission of a certain power over a given distance by continuous current, 100 tons of copper were required for the line, then the single phase alternating and the two phase four wire system would require 200 tons. The two phase three wire system would require 290 tons, and the three phase three wire system only 150 tons; therefore, so far as the line might be concerned, there would be a distinct advantage in the employment of the three phase system.

A paper by Mr. A. B. Snell, "On Water Power as a Source of Electricity," was next read. The subject is not one of such great practical importance in England as in more mountainous countries. Our rivers are small, and in comparatively few cases is there sufficient head to make the utilisation of them profitable with such a form of water motors as have yet been introduced. Mr. Beaumont described a variable power gear for electrical locomotives which he had devised. The object of the gear is to give increased power for the motor when starting the train. By its use the designer hoped that electric motors might be made of very much smaller size. A point of interest raised during the discussion was the advisability of using epicycloidal gear, it being the opinion of Prof. Hele Shaw and others who had worked with this gear that it was not suitable for heavy loads. Mr. W. B. Sayers read an interesting and valuable paper, in which he described a form of self-exciting armature and compensator for loss of pressure, which he had devised. The invention is one of considerable importance, the object being to obtain sparkless commutation. The device, however, is not quite new, it having been previously described, and doubtless is known to the majority of our electrical readers. Monday's proceedings closed with a paper by Mr. E. Payne, on "Electrical Conductors."

Tuesday, September 19, was the last day on which Section G met, and the proceedings opened with a paper by Mr. O. T. Olson, on "Flashing Lights for Marine Purposes." The author proposed that each important navigational light in the world should have a distinctive number which it should continuously flash at night, so that there might be no danger of any particular light being mistaken by the mariner for another. During fog the signals were to be conveyed by gun-cotton explosion. Probably Mr. Olson's suggested signals are somewhat too complicated, although possibly as simple as could be practically arranged were every light given a separate number. Nevertheless, something might be done towards systematising the signals given by various lights in certain geographical sections.

Mr. William S. Lockhart gave an interesting description of an automatic gem separator which he had devised. The apparatus acts by means of the difference in specific gravity between the gems and the gravel, quartz, &c., in which they are found. A stream of water flowing at a uniform velocity is directed upwards through an annular chamber. The material to be separated is fed in through a hopper at the top of the apparatus, and falls into the annular chamber. The velocity of the stream is so regulated that the lighter and more worthless substances are carried with it, whilst the heavier gems descend into a receptacle at the bottom of the machine. One of the separators was shown at work in the Section, water being laid on for the purpose, and some diamonds were actually separated from the pebble and quartz with which they were mixed. There are, it is hardly necessary to say, many points in detail which require careful consideration in working out before such a machine as this is brought to the perfection of practical working. Mr. Lockhart appears to have been very successful in overcoming the difficulties of the problem he had to solve in designing the machine.

A paper by Mr. Walker, "On Ventilating Fans," was read, and the proceedings in this Section closed by Prof. Robinson describing the Wicksteed testing machine, which had been erected in the engineering laboratory of the college. The members of the Section were able to see this machine in action during the afternoon. In most respects it does not differ from the ordinary type of Wicksteed testing machine, but there is a clever gear for shifting the poise. This was operated by hydraulic power by means of wire rope. The device is undoubtedly an improvement on the old gear, both in rapidity of action and absence of noise. There is a neat parallel adjustment for preventing the pulley of the rope influencing the result of the test.

The proceedings in Section G were brought to a conclusion by the usual vote of thanks to the sectional president, Mr. Jeremiah Head.

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## *ANTHROPOLOGY AT THE BRITISH ASSOCIATION.*

AFTER the President's address on Thursday, Mrs. Lilly Grove read a paper on the ethnographic aspect of dancing. Dancing corresponds to a universal primitive instinct in man. At all periods there were three kinds of dances: (1) the imaginative or poetic; (2) the descriptive; (3) the religious. This last is most important, and may be called the fountain of the other kinds. Religious dances can be divided into two classes: (*a*) dances directly in honour of the deity; (*b*) dances intended to propitiate the deity. A strange feature is the fact that so many dances are performed in a circle. War-dances are of two orders, either as a preparation for war, or as a rejoicing after triumph. The Corroboree illustrates the former aspect. Excellence in dancing among savages is obtained by very simple means: anyone who makes a mistake is killed.

Prof. Windle read a paper on anthropometric work in schools. It appears from answers to a circular sent to the head-masters of one hundred of the largest schools in the United Kingdom, that some form of measurement is or has been carried on in twenty-five schools, but that the methods adopted differ considerably. The author suggested that an endeavour should be made to encourage and systematise such work.

Dr. W. Wilberforce Smith read a paper on anthropometric weighing; and the following reports were also presented to the section: Report of the Anthropometric Laboratory Committee, and Report of the Physical Deviations Committee.

On Friday, the committee appointed to make an ethnographical survey of the United Kingdom presented their first report. Prof. Hans Hildebrand then read an important paper on Anglo-Saxon remains and coeval relics from Scandinavia. The question proposed was to determine the relations which existed between the civilisation of Scandinavia and that of England during the period between the arrival of the Angles and the Saxons on the English coast, and the time of their conversion to Christianity; roughly, that was from the middle of the fifth to the middle of the seventh century of our era. These limits were not exactly determinable, because both the Anglo-Saxon immigration and the spread of Christianity among the new-comers were not the work of a few years only, and progressed with very different rapidity in different parts of the country. During this period Sweden had no chronological record, and Christianity had no hold on that country until the eleventh century. The criterions of date, therefore, on the Scandinavian side were of purely archæological character. There were a few instances of Roman and Byzantine coins found associated with Scandinavian antiquities, and as these could hardly have found their way northward before the downfall of the Hunic Empire in Central Europe, they gave some indication of the date of the objects with which they were lost or interred. In England similar date evidence occurred, but was vitiated by the fact that the coins had often been long in circulation before they were buried. The practice of burial also, while it entirely superseded cremation when Christianity became predominant, appeared to have coexisted with the older method during the later Pagan period, and could not be taken as affording an accurate criterion of age.

And there was the further difficulty in comparing English and

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